

○ BLOOD

Connective tissue in fluid form

- ✓ **Fluid of life** – carries oxygen from lungs to all parts of body and carbon-di-oxide from all parts of the body to the lungs
- ✓ **Fluid of growth** – carries nutritive substances from the digestive system and hormones from endocrine gland to all the tissues.
- ✓ **Fluid of health** – protects the body against diseases and get rid of unwanted substances by transporting them into excretory organs like kidney.

Physical Characteristics of Blood

- ✓ Thicker than water
- ✓ 8 % of total body weight
- ✓ Blood volume
- ✓ 70 mL/kg of body weight
- ✓ 5 - 6 liters in males
- ✓ 4 - 5 liters in females
- ✓ Temperature - 100.40F
- ✓ pH - 7.35 to 7.45

Blood Functions

1. Respiratory

- ✓ Transport O₂ from lungs to tissues
- ✓ Transport CO₂ from tissues to lungs

2. Nutrition

- ✓ Transport “food” from gut to tissues

3. Excretory

- ✓ Transport waste from tissues to kidney (urea, uric acid)

4. Protective

- ✓ White blood cells , antibodies, antitoxins.

5. Regulatory

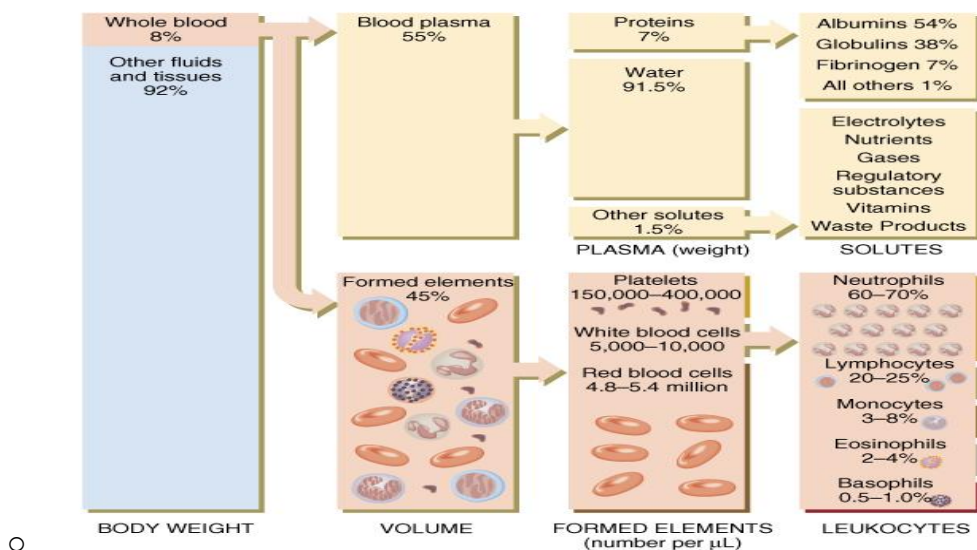
- ✓ regulate body temperature
- ✓ regulate pH through buffers
- ✓ coolant properties of water
- ✓ vasodilatation of surface vessels dump heat
- ✓ regulate water content of cells by interactions with dissolved ions and proteins

6. Body Temperature

- ✓ Water- high heat capacity, thermal conductivity, heat of vaporization
- ✓ Typical heat generation is 3000 kcal/day

Blood composition

Suspension of <i>cells</i> in plasma (carrier fluid)		45% Cells
		55% Plasma
Red cells (erythrocytes)	5x10 ⁶ /mL	99%
White cells (leukocytes)	7x10 ³ /mL	
Platelets (thrombocytes)	3x10 ⁵ /mL	< 1%



Blood Plasma

- ✓ Straw colored clear liquid
- ✓ Contains 90% water
- ✓ 7% plasma proteins
 - created in liver
 - confined to bloodstream

Albumin

- maintain blood osmotic pressure

Immunoglobulin

- antibodies bind to foreign substances called antigens
- form antigen-antibody complexes

Fibrinogen

- for clotting

✓ 2% other substances

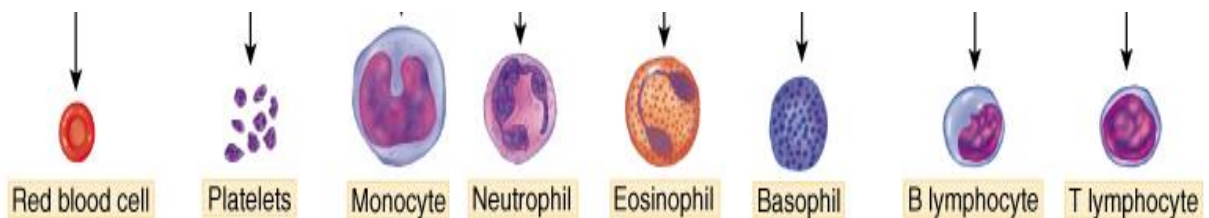
- Nutrients, electrolytes, gases, hormones, waste products

Functions of Plasma proteins

- ✓ Coagulation of blood – Fibrinogen to fibrin
- ✓ Defense mechanism of blood – Immunoglobulins
- ✓ Transport mechanism – α Albumin, β globulin transport hormones, gases, enzymes, etc.
- ✓ Maintenance of osmotic pressure in blood
- ✓ Acid-base balance
- ✓ Provides viscosity to blood
- ✓ Provides suspension stability of RBC
- ✓ Reserve proteins

Formed Elements of Blood

- ✓ Red blood cells (R.B.C.)
- ✓ White blood cells (W.B.C.)
 - granular leukocytes
 - neutrophils
 - eosinophils
 - basophils
 - agranular leukocytes
 - lymphocytes - T cells, B cells, natural killer cells (N.K.C)
 - monocytes
- ✓ Platelets (special cell fragments)



Functions of RBC

- ✓ Transport oxygen from lungs to the tissues (oxyhemoglobin).
- ✓ Transport carbon-di-oxide from tissues to lungs (carboxyhemoglobin)
- ✓ Hemoglobin acts as a buffer and regulates the hydrogen ion concentration (acid base balance)
- ✓ Carry the blood group antigens and Rh factor
- ✓ Functions of Neutrophils
- ✓ First line of defence against invading micro-organisms.
- ✓ Powerful and effective killer machine – contains enzymes like protease, elastase, metalloproteinase, NADPH oxidase; antibody like substances called defensins.

- ✓ Defensins – antimicrobial peptides active against bacteria and fungi.
- ✓ 3. Secrete Platelet Aggregation Factor (PAF) – accelerates the aggregation of platelet during injury to the blood vessels

Functions of Eosinophils

- ✓ Secrete lethal substances at the time of exposure to foreign proteins/parasites
- ✓ Eosinophil peroxidase – destroy worms, bacteria and tumor cells.
- ✓ Major basic protein – damage parasites
- ✓ Eosinophil cationic protein (ECP)- destroys helminthes.
- ✓ Eosinophil derived neurotoxin – destroys nerve fibers (myelinated nerve fibers)

Functions of Basophils

- ✓ Basophil granules release some important substances like –
- ✓ Histamine – Acute hypersensitivity reaction- vascular changes, increase capillary permeability
- ✓ Heparin – prevents intravascular blood clotting
- ✓ Hyaluronic acid – necessary for deposition of ground substances in basement membrane
- ✓ Proteases – exaggerate inflammation
- ✓ Basophil have IgE receptor – hypersensitivity reaction

Functions of Platelets

- ✓ Blood clotting
- ✓ Clot retraction
- ✓ Defence mechanism
- ✓ Homeostasis
- ✓ Repair and rupture of blood vessel